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F-16 AIRCREW TRAINING DEVELOPMENT PROJECT

Contract No. F02604-79-C8875 ✓

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PREVIOUS ISD PROGRAM REVIEW.

DEVELOPMENT REPORT NO. 2
MARCH 1981

Prepared in fulfillment of CDRL no. B006

by

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PREFACE

This report was created for the F-16 Aircrew Training Development Project contract no. F02604-79-C8875 for the Tactical Air Command to comply with the requirements of CDRL no. B006. The project entailed the design and development of an instructional system for the F-16 RTU and instructor pilots. During the course of the project, a series of development reports was issued describing processes and products. A list of those reports follows this page. The user is referred to Report No. 34, A Users Guide to the F-16 Training Development Reports, for an overview and explanation of the series, and Report No. 35, F-16 Final Report, for an overview of the Instructional System Development Project.

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F-16 AIRCREW TRAINING
DEVELOPMENT PROJECT REPORTS

Copies of these reports may be obtained by writing the Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22314. All reports were reviewed and updated in March 81.

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EXECUTIVE SUMMARY

The F-16 Instructional Systems Development (ISD) effort represents the most comprehensive application of ISD principles and procedures for pilot training yet conducted within the Air Force. In order to avoid the shortcomings and problems of previous Air Force applications of ISD, a careful analysis of past Air Force ISD programs has been accomplished to determine: (1) the lessons which have been learned that relate to the F-16 efforts and (2) those problems that have presented the most difficulty in the application of ISD technology to pilot training. This report summarizes the results of that analysis.

Interviews were conducted with ISD personnel from A-7, A-10, F-15, and F-4 communities. Conclusions drawn from the results of the interviews are as follows:

1. Ensure command support and understanding of F-16 ISD programs and principles is maintained.
2. Man ISD teams adequately and with trained ISD specialists.
3. Document all F-16 efforts including rationales for all decisions and policies for use in future programs.
4. Provide sufficient support for data handling and access, i.e., a dedicated ISD ADP system.
5. Establish a joint ISD/FLIT team to coordinate and smooth the way from Fighter Lead-in Training to Combat Crew Training (CCT) squadrons.
6. Tactics training will be a problem area. Experimentation and use of other fighter aircraft experience will be necessary.
7. Review thoroughly the A-10/F-15 ISD experience for insight in establishing the line of division between CCT subjects and continuation training subjects.
8. Special attention should be paid to alternate training methods to substitute for the unavailability of trainers in the initial phases of the F-16 training project.
9. Objective evaluation, (CROs and CRTs), must be developed in close cooperation with STAN/EVAL personnel.

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1.0 INTRODUCTION

1.1 Purpose

The F-16 Instructional Systems Development (ISD) effort represents the most comprehensive application of ISD principles and procedures for pilot and instructor training that has ever been conducted within the Air Force. During this effort, the ISD team hopes to avoid the shortcomings of previous Air Force applications of ISD. An essential first step in ensuring this has been the careful analysis of previous USAF ISD efforts to determine: (a) the lessons which have been learned through experience that are applicable to the F-16 effort and (b) those problems that have presented the most difficulty in the application of the ISD technology to aircrew training. This report is intended to summarize the results of this study.

The accumulated experience of the programs that have been reviewed will provide information highly beneficial to the F-16 ISD program. Problem areas in previous projects will be avoided through careful planning, and areas of strength in previous projects will be studied and built upon.

In addition, another positive result of performing this review has been the establishment of open lines of communication with currently active ISD teams within the USAF aircrew training community. All have been openly and enthusiastically supportive of the F-16 program, and a positive attitude of mutual support has been established. This will not only aid the F-16 program, but it is hoped that the other ISD teams within the Air Force will also benefit from the F-16 experience, thus enhancing their individual efforts.

1.2 Scope

The ISD programs that have been reviewed in preparing this report were selected on the basis of their direct applicability to the F-16. The review covered all aspects of the ISD process, from the technical concerns for instructional design and engineering of psychological variables to the practical problems of implementing, managing, and maintaining instructional systems in a real-world operational environment. Since the F-16 project will include activities at all points of this spectrum, data were gathered on as many relevant issues as could be identified.

1.3 Methods and Participants

The task of conducting this review was divided into the following three parts:

- (1) Development of the review questions and interview guideline.
- (2) Identification/selection of ISD teams to participate.
- (3) Conduct of the reviews.

1.3.1 Development of Review Questions

The primary objective in development of the questions to be used in the review effort was to develop an interview guideline that would provide sufficient information on past ISD efforts across all areas of project concern. Since the F-16 project involves teams of instructional psychologists and technologists, training systems specialists, and computer support specialists, questions from each of these areas were written and incorporated into the final interview guideline.

The final questions generated were the result of consultations among the contractor's team and were based on the following considerations:

- (a) A detailed review of the ISD process.
- (b) The contractor's past experience in ISD.
- (c) Suspected weakness/problem areas in past ISD efforts.
- (d) Suspected strengths of previous ISD efforts.

1.3.2 Identification/Selection of the Systems to be Reviewed

Early in the F-16 ISD program effort, previous Air Force aircrew training ISD programs were identified as candidates for review. These included the A-7, A-10, F-4, and F-15. It was decided that the review effort could best be concentrated on existing Tactical Air Command (TAC) fighter aircraft systems, which were directly relatable to the F-16 system, as stated above.

Having identified the Systems to be visited, visit schedules were arranged with the 4444th Operations Squadron at Luke AFB for the F-4 and F-15, and at Davis-Monthan AFB for the A-7 and A-10 systems.

1.3.3 Conduct of the Reviews

During the review visits, interviews were conducted with current ISD team members by using the interview guideline discussed in detail in the following sections of this report.

During the conduct of an interview, the ISD team representative was asked each question on the guideline, and his response was recorded both on tape and in the interviewer's notes.

The interviewee was encouraged to expand and elaborate upon the questions posed with further detail and clarification. When the interviewer detected that information potentially applicable to the F-16 problem might be available, probing questions were used and the respondent was invited to comment further.

In addition to interview notes and tapes, documentation was collected from each ISD team where available. Documents solicited included syllabi, media selection documents, sample task analyses, sample instructional materials, criterion-referenced objectives (CROs) criterion-referenced tests (CRTs), sample management tools, and other ISD-generated documents. Many of these were collected, although the total amount available was not as large as expected.

2.0 INTERVIEW RESULTS

2.1 Introduction

The results of the interviews on previous ISD programs are presented in the following pages within the context of the interview guideline. Each question asked during the interview is stated, followed by a composite summary of the responses across the four ISD programs reviewed. A summary of document reviews is not contained in this report. The detail required for such a review would be unwieldy and would consume inordinate amounts of time. The result of the document review will appear as elements in the design of F-16 project materials and documents.

2.2 Interview Data Summary

1. During your system design, development, and implementation, what methods did you use for:

A. Task Analysis (TA)?

The TAs for the A-7 and A-10 were developed based upon the same approach specified by a contractor. A copy of the A-7 program report has been acquired and is under review. The F-15 task analysis was also performed by a contractor. There have

been many problems with it since it is system- and equipment-oriented rather than performance-oriented. The F-4 task analysis is based on the A-7 approach; however, no contractor assistance was included in the development of the F-4 program.

B. Definition of training objectives?

Generally, these have been developed by a "committee consensus" approach using instructor pilot subject matter experts (SMEs) and ISD team members. In some cases, attempts have been made at writing specific behavioral objectives (SBOs). These, however, have proven to be inadequate in that they are not stated in behavioral terms (e.g., "will understand," "will have a knowledge of," etc.).

C. Development of CRO/CRTs?

In nearly all cases, ISD teams are just beginning to get involved in the attempt to generate CROs and CRTs.

D. Course sequencing?

Generally speaking, sequences are developed along more or less conventional lines: for example, the F-4 and F-15 programs are very similar because all F-15 instructor pilots (IPs) were former F-4 IPs. The F-15 and F-4 blocks of instruction are basically the same for both academics and aircrew training tasks.

E. Media trade-off/selection?

Except for the A-7 report, documentation or knowledge of how this process originally took place is not known by the present ISD team members.

2. What data collection forms (formats) and procedures were used? May we have copies?

The same data formats and procedures were used for the F-4, A-10, and F-15 as for the A-7 initial effort. Sample task training analysis forms were collected along with the "A-7 Training Analysis Guide" which contains additional forms and procedures.

3. What was your approach in terms of the task analysis? Did you, for instance, use one analyst and three SMEs? How many SMEs were involved?

The A-7 was the only program where a contractor analyst was involved. The analyst conducted sessions in which at least three SMEs participated. The F-4 and A-10 programs used three to four team members at any one time working as a committee.

The F-15 TA was originally performed by the contractor at his facility. This was a "one-shot" effort with no requirement

for update. The analysis was performed before the aircraft was flying and was based largely on everyone's "best estimate" at the time of what the aircraft could do and how it would be employed. Therefore, the task analysis was tactically outdated by the time the aircraft arrived.

There were no more than three to four F-15 ISD team members at any one time. The team members had to divide their time between the ISD effort and flying.

4. What data management forms did you use for:

A. TA storage?

The A-7 program procedures were followed in all cases. The task analysis is input to the computer based upon the data from the "Task Training Analysis" sheet. This has proven to be more detailed than necessary.

B. TA retrieval?

Across the ISD programs, access to the data base was a problem. Those who know how to program the computer system for retrieval are gone. Problems with the fundamental computer program also exist. Computerized TA storage and retrieval are so difficult as to be virtually beyond the reach of the average ISD team with no computer expertise.

C. TA sort?

Again, the A-7 program sort capabilities and procedures are used. The sort capability is rather extensive in that one can "sort on any heading" (from the "Task Training Analysis" sheet) that is inserted in the computer (e.g., tasks per media, media capability to train a task, etc.). As in TA retrieval, the procedures are not used because they would require much time and an extensive knowledge of computer programming and specific computer programs.

5. How did you handle program update and revision of:

A. System constraints?

B. Aircraft (A/C) capabilities and missions?

C. Data support requirements/programs?

All projects reviewed are attempting to maintain their present instructional programs and have little time for innovation and change. Only A/C system changes are reflected in the update of training materials. Such system changes are, of course, more prevalent in the A-10 and F-15 than in the older A-7 and F-4 programs.

Primarily revisions are being driven arbitrarily by higher headquarters direction and requirements without consideration of ISD planning and methodology. One comment was, "What is required is stronger headquarters support of the ISD approach and a better understanding of ISD requirements." This remark was intended to mean that additional manpower on ISD teams was needed and that mandated changes needed to reflect greater insight into the processes and effects of ISD.

6. What approach/procedures/formats did you use/are you using for:
 - A. Program update?
 - B. Student testing and evaluation (both academics, nonflight and flight, including procedures and formats for student grading/performance)?

As far as updating is concerned, the programs which have been reviewed are being updated as directed by TAC Headquarters. All programs reviewed are currently using the TAC standard 0 to 4 grading system. Task standard is a grade level of 2 (i.e., "He recognizes and corrects errors"), with a grade level of 3 required for critical tasks.

For the F-15, students go through emergency procedures training every two weeks in the cockpit procedures trainer (CPT), where their performance is evaluated.

7. What do you see as the "key" problems in applying ISD to new flying training programs?

The responses to this question can be summarized as follows:

- A. For emerging systems, such as the A-10 and F-15, the data available are not firm. Procedures are not firm. Performance data on the A/C are not reliable, and there is an insufficient data base. In the case of the F-15, this resulted in a complete set of sound/slide programs that were out of date on delivery due to changes in the "Dash One" manual procedures.
- B. Extensive system changes and changes in related procedures, especially during the first year, caused the F-15 program many problems.
- C. There is a problem in keeping pace in the syllabus between the ground training and flying training due to the small number of A/C and A/C availability at the beginning.
- D. Presently F-15 ground training is being driven by the flying training schedule, giving students insufficient ground training time before they fly.

- E. The lack of a simulator early in the program was a problem for both the A-10 and the F-15. Without the simulator, the "systems" training in terms of dynamic feedback was a problem. F-15 finally acquired videotapes depicting the system performance, which were very successful.
 - F. Many problems were experienced with the impact of personalities on the program, i.e., commanders and their particular wishes. Some team members felt the need for a better documentation of the ISD processes and rationale to "fend off irrational changes to the program".
8. If you could start anew on your particular ISD program, what would you recommend to improve the application of the ISD approach?

Responses to this question were varied. However, the following is an applicable summary across systems:

- A. It is critical that complete and detailed documentation be developed and maintained for decisions made during design and development.
- B. ISD teams should be more adequately staffed, especially with ISD-trained, subject-matter qualified personnel.
- C. There should be a command-wide education program on ISD in order to provide a more positive understanding and support of ISD efforts.
- D. In the case of emerging systems (A-10/F-15), those interviewed felt that they should not have gone to audio-visual (AV) materials as early as they did because of system changes. The A-10 program did try to prevent this problem by avoiding inclusion of procedural tasks in sound/slide programs. There was a general feeling that easily revised written materials (e.g., workbooks) early in the program would be a better medium for instruction in an emerging A/C system.
- E. Both A-10 and F-15 interviewees felt that tactics will be a block of instruction that will be very difficult to handle because of "experimenting during the initial stages of the program." The F-16 joint test force (JTF) will be able to provide some input, but members of the JTF have usually been out of the fighter community for some time and are not necessarily knowledgeable about current tactical scenarios.

The F-15 community engaged in extensive experimenting with tactics after the aircraft began to arrive at Luke. They feel that F-15 and F-16 tactics should be fairly similar and their efforts should provide a valuable data base for F-16.

9. What was your data management approach (automated data handling)? Were you keyed to the existing TAC B-3500 system?

All systems reviewed are keyed to the existing TAC B-3500 computer system. The biggest problem appears to be access to the data base, since another agency on base must be dealt with in order to enter/retrieve data. The opinion was that what is needed is a more responsive, dedicated system with at least one assigned programmer to maintain, update, and access the data base in response to ISD team needs.

10. Did you find in your recommended (preferred) approach that you ran into problems with existing AF/TAC training doctrine/procedures?

The answer to this question was "yes" across all systems reviewed. It is apparent that existing regulations do not recognize the requirements of ISD; they reflect a lack of understanding of ISD and the systematic approach.

The A-10 team had problems regarding a rewrite of the 55 and 51 series documents to bring them more realistically in line with the A-10 system and its tactical employment.

It was also mentioned that a greater effort to align training (based on the ISD approach) and standard evaluation (STAN/EVAL) requirements is required in order to attempt to alleviate disparities between performance evaluation techniques.

11. We would like to have any copies of actual program documentation, such as:

- A. Syllabus.
- B. Media selection.
- C. Sample formats used in implementing your program, i.e., TAs, CROs, CRTs, scheduling determination, etc.
- D. Instruction materials.
- E. Goal Analysis.

Syllabi were obtained from all four communities. Where available, phase manuals and instructor guides were also obtained.

Very little documentation exists for media selection, with the exception of the A-7 program document.

A sample of the A-7 program's first cut at CROs was obtained and is being reviewed.

12. Please feel free to give us any general comments regarding ISD, its application and problems.

A key response across the systems reviewed was a "lack of command-wide support and understanding." In addition, there was consensus that there is a lack of: (a) personnel trained in the ISD process, (b) funding and proper facilities for media development and support, and (c) time for all schedule commitments.

One response was, "How comprehensive do you want to be? What do you want out of the program? If ISD is to be done properly, it requires a realistic allocation of the three items stated."

13. How early in the planning process did your ISD people get involved?
- A. Prime system planning and design?
 - B. Maintenance planning and approach design (A/C availability)?
 - C. System support planning and approach design?

Probably of most importance here are the responses of the A-10 and F-15 communities, since their experiences are more aligned with what we will experience with the F-16 system.

In the case of the A-10, the ISD team was formed well before A/C delivery, using the A-7 IPs. For the F-15, three to four F-4 IPs were chosen early in the program and appointed as the F-15 ISD team prior to A/C arrival.

In both cases, the teams had to deal with "second-hand" knowledge. They were not able to gain as much interface with the JTF as desired, and they did not have an opportunity to fly the aircraft. For the F-15, some visits to the factory were made.

14. What problems arose from getting the system design and development phases late? How did you handle these problems?

Here again, responses from the A-10 and F-15 interviewees are most appropriate. Their biggest problem was the development of new tactics. In doing so, they (a) took inputs from JTF personnel and (b) studied available documents on employment of the A/C. From these they made an initial guess at appropriate

tactics, flew F-4 type tasks, and determined how they could improve them based on performance of the A-10/F-15 and its systems. Over the course of the first two or three classes, they made tactics section revisions.

15. To some degree, tactics development always waits for the A/C delivery and initial tactical training sufficient to get a background of experience with the particular A/C. How do you handle the development of the tactics part of the training to get maximum development efficiency?

Responses to this question are covered under question 14 and other previous questions and responses.

16. How did you handle problems of deciding how much training to eliminate by selection (e.g., only pilots with operational experience in similar A/C or whatever), and how much of the required training would be conducted in the combat crew training squadron (CCTS) and how much put off to be carried over later in the operational squadron?

Early in the F-15 program, it became apparent that due to aircraft and sortie availability, the "mission-ready" graduate concept could not be attained. Consequently, TAC headquarters guidance was requested as to what graduates should be capable of doing. The decision was that the F-15 program should be geared to produce a "safe" student who could practice to mission-ready criteria within the operational unit. This guidance applied to experienced fighter pilots only. At the time of this interview, the undergraduate pilot training (UPT) graduate program for the F-15 had not been completely decided and will depend upon the particular fighter lead-in training received and the availability of F-15 aircraft.

In the case of the A-7 and F-4, the attempt was and is to bring the student as close to mission-ready as possible. The student actually qualifies as mission-ready in the operational squadron follow-on (continuation) training.

The A-10 personnel feel they had the same problem we will have in the F-16. When it came to tactics, they "ran into a stone wall" because there was not an operational squadron in existence, and the line of division between CCTS training and operational squadron (continuation) training could not be clearly defined. However, it was felt that, ideally, formal training (CCTS) should mirror continuation (operational squadron) mission-ready requirements as much as possible.

17. Did you use system operation task analysis data, mission performance task analysis data, or both?

Responses across the four communities varied. For the F-15 and F-4, both kinds of analysis were performed. For the A-7, a mission-oriented task analysis was carried out. In the case of the A-10, a mission analysis was intended, but resource constraints resulted in the use of the contractor's task listing only, which was basically system operation oriented.

18. How did you check reliability and validity of student performance evaluation techniques?

In general, formal assessment and use of student evaluation information are weak. In the A-7 community, fail items and grade slips are used to try to revise academics and syllabi. The A-10 program is attempting to develop a more objective evaluation program. No objective, procedure-oriented program currently exists in the F-4 or F-15 programs.

19. Did the performance of the initial students (especially if they were the "cream of the crop") provide an adequate basis for evaluating the instruction for later classes (UPT student, for example)?

In the F-4, the program was ongoing, and the initial students were no different from those following. In the F-15, no UPT "B" students have been trained and deployed yet, so there is no data.

In the A-7 program, changes were needed in the training provided to later classes, as the "cream-of-the-crop" students ran out. In the A-10 program, expansions were made in parts of the curriculum for the same reason.

20. Were you able to close the feedback loop between operational squadrons and the CCTS in order to provide a flow of information for ISD correction/improvement?

All programs are attempting to close the loop. All have problems of one kind or another. In the F-4 community, only a 30 percent return rate has been attained for evaluation questionnaires sent out to operational commands. The A-7 group is in the process of attempting to improve this kind of feedback. The A-10 program feels the need for a more formalized approach than the one it has now. The F-15 cadre used field interviews for follow-up on their first graduates and feel they obtained some good subjective data. However, they also feel the need for CROs in their program in order to enable more objective evaluation feedback from the field.

21. How did you handle the "halo" effect in grading officers? Were you able to establish an "objective" grading/evaluation system?

This appears to be a universal evaluation problem. In every case, the indication is that difficulty of objective grading is proportional to rank.

22. Was the time-line schedule met?

In every case, the individuals interviewed believed or were sure that the schedules were slipped to some degree. In the F-15 community, the team felt it had met its own schedules but was detained by outside factors, such as a delay in simulator delivery.

23. Was the funding exceeded?

The individuals interviewed did not have data available to document answers to this question, but they generally believed that funding was exceeded to some degree.

24. Standardized ISD and automated data processing (ADP) terminology?

There was unanimous agreement that this is a problem, that it is being addressed by headquarters, and that it will probably be resolved by a rewrite of TAC B-3500 procedures for ISD and ADP systems.

25. What about students returning to a system after being away? Do they go back through a "special course"?

In general, these students are sent back through a transition course. This is currently true for the F-4, the F-15, and the A-7, depending on the length of stay-away. The A-10 system is new and the procedure is not yet firm, but it is assumed that a tailored transition course will be provided, again depending on the length of stay-away. The transition courses tend to be tailored to the individual needs of the students to aid in their proficiency advancement.

26. To what extent was your training system self-paced?

All four of the programs examined are lockstep. In the F-4 program, proficiency advancement is possible, but advanced students still have to wait and graduate with their class. CPTs and sound/slide materials are available in the A-10 program for students to use on their own time, but the program is lockstep. The F-15 program personnel interviewed believe that program efficiency could be increased by appropriate self-pacing (especially in the transition course).

27. Can students work ahead?

In all cases, students can work ahead to some degree. Proficiency advancement is possible in the F-4 program; the learning center is made available to A-7 students; and AV

programs and the -1 and -34 manuals are available for the F-15 students. The F-15 personnel interviewed, however, did not feel that the structure of the academics and syllabus made such work effective because students achieve no savings in time. Also, as noted above, all programs are lockstep in spite of the capabilities for students to work ahead.

28. How were stragglers handled?

In all cases, stragglers are allowed three extra rides to qualify for each phase before being sent to the review board. In the F-15 community, the only stragglers now are the ones occurring as the result of scheduling problems, i.e., the student cannot be adequately scheduled to the necessary academic and A/C sessions in the required timelines.

29. How much pretesting was used? Was it effective?

Generally, pretesting is not used in the communities. The F-4 community uses some for the "backseat" student. However, it was agreed across systems that pretesting would be desirable.

Pretesting would not be beneficial in aircraft systems areas. The student still needs to learn the new aircraft and its systems. In air-to-air, pretesting might largely eliminate formal training in basic fighter maneuvers (BFM) or in intercept, depending upon the student's fighter lead-in training.

30. What were students' preferences on lesson types?
Media? Strategy?

Responses in this area were highly variable. The A-7 community had no data at all on this subject. Sound/slide programs were received in the A-10 program, but got variable responses in the F-15 program where there was a wide range of quality. "Retreads" in the F-4 program particularly liked the self-pacing capability of available sound/slide programs as compared to lecture alternatives. Students in the F-15 program were very positive about the videotapes available in the inertial navigation system (INS), radar, and flight control systems areas and with the simulator.

31. Did you have multiple syllabi? Did they work?

All programs had multiple syllabi. All had resulting scheduling problems. As might be guessed, the major scheduling problems involved limited availability assets, principally A/C and simulators.

32. How was OFT (operation flight trainer) and A/C work integrated? Was it done successfully?

In all cases, the strategy used was to integrate simulators and air work with academics, generally proceeding from academics

to trainer to aircraft based on prerequisite structures determined by some form of training analysis. Any lack of success in this approach appeared to stem from difficulty in scheduling simulators so as to achieve the planned sequences. That is, integration of simulator and aircraft exercises was successful whenever scheduling allowed the planned sequence to be implemented.

33. What administrative problems were encountered in using the system?

No major problems were indicated in any of the programs in the area of facilities or in the updating of instructional materials. No instructor training problems were raised by F-4 and A-10 personnel. In the A-7 program, a problem was expressed in the area of instructor-candidate qualifications, where a need for better prerequisites was felt. In terms of resources, the F-4 and F-15 programs are constrained by the number of sorties available. The A-10 program suffered from a lack of resources in all areas.

34. How were instructors scheduled? What duties did they have?

Typically, academic instructors also fly with the students. IPs of the squadron do not teach academics.

If one adhered strictly to the syllabus, academic instruction and flying instruction (and instructors) should probably be assigned to the same squadron.

35. What incentive systems are built into the system you used?

All programs tend to assume that intrinsic incentive is built into the natural competitiveness of fighter pilots. In the A-7 and F-4 programs, rewards help make this explicit in the form of "top gun" and "top student" designations in the A-7 community, and "top gun," "top front seater/top back seater/top overall," and "top academic (front/back)" designations in the F-4 community.

36. How long is your syllabus?

Copies of syllabi were obtained from all programs reviewed and are a part of the F-16 ISD data file for further review.

37. Do all students reach mastery? What happens to those who don't?

For the A-7, F-4, and A-10 communities, the answer is, generally, yes. However, this is not objectively defined. If there is a problem (e.g., because of a scheduling difficulty, a sortie is missing), this is noted and goes forward with the

student's records, stating the situation and making a recommendation for correction.

The "B" course (UPT) student is required to achieve some subjective performance level. However, again the "B" course does not have objective grading of performance in all flying training tasks. At this point, the only objective evaluation is 60-2 on instrument requirements. He has to be "safe." If he does not qualify, extra rides are allowed until he does.

38. Does the training system or the personnel system define the student input?

All communities responded that the training squadron has no influence on student input.

39. How do you receive feedback from the operational squadron?

The response to this question has been covered earlier. The A-7 community has tried student evaluation questionnaires with less than adequate response. Typically, the questionnaire approach has not met with favorable response. F-15 found that personal follow-up and interviews proved more effective.

40. Does the training squadron develop student requirements--or is the number of students input to the system dictated?

The response here was unanimous across systems that student input is determined by higher authority.

41. Are the students' grades stored automatically?

No. At present only manual grade books are used in all the systems reviewed.

42. Are grades tied to objectives?

The response was the same across systems. Grades are tied to objectives only in terms of USAF/TAC 60-2 STAN/EVAL requirements. However, all communities reviewed are striving to develop objective measures.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Introduction

The review of previous ISD Programs and the resultant data will undoubtedly prove to be of great value to the F-16 ISD Team in design, development, and implementation of the F-16 Training System.

The ISD Team members of all the programs reviewed were extremely cooperative. The data obtained was based upon personal experiences in the application of the ISD approach. Knowledge of these "real world" problems as they have occurred in the past should assist the F-16 ISD Team in avoiding or tempering some of the major problem areas encountered in the past.

Readers of this study should bear in mind that it attempts to gather and present as much information from as many experienced persons as possible within time and budget constraints. The data gathered does not represent a sophisticated and exhaustive study of the total TAC ISD experience, employing authorized TAC spokesmen and all possible recognized sampling and data gathering techniques which would be employed in a formal study. Such was beyond the scope and spirit of what was intended within the F-16 development project. Though much confidence is placed in the data reported herein, it is recognized that these data were gathered for the specific purpose of surveying an active operational area prior to entering into the same area to perform development. This study was not conducted for the purpose of recommending major command-wide changes in policy or practice. It is appropriate that this report be suggestive of areas which deserve further, more formal study but those studies are yet required, followed by careful planning before change action is recommended.

The areas of concern, conclusions, and recommendations presented in the following sections of this report are those of the contractor's ISD Team members and should not be interpreted as necessarily reflecting an official view of TAC personnel or other Air Force agencies contacted and interviewed during this effort.

3.2 Areas of Concern and Recommendations

The intent of this section is to name areas of concern which appear to be most relevant to the F-16 ISD effort. The areas of concern addressed include the following:

Command Support

Manning

Initiating and Maintaining ISD Documentation

Data Processing and Handling

Fighter Lead-in Training Output

Tactics Training

CCTS and Continuation Training

Training Alternatives Awaiting Simulator Delivery

STAN/EVAL and Objective Student Evaluation

3.2.1 Command Support of ISD Programs

The review results show that there exists a very definite need for better command-level understanding of ISD programs and the principles built into ISD products. Instructional systems, like any complex system, respond to internal changes with a corresponding change in output.

The review of past ISD programs showed that revisions to TAC training programs are often driven by higher headquarters direction. Indications show that they are often not made through an understanding of the ISD process and its products but because of demands placed upon headquarters which result in sometimes arbitrary changes being mandated to ISD teams.

Based on the results of the review, a concerted effort is recommended on the part of the F-16 ISD Team in maintaining the already strong education and information program at the TAC Headquarters level which they have initiated. This will increase the likelihood that future changes to the instructional system will be made with an understanding of the likely effect upon the system's student output.

3.2.2 Manning

All previous ISD programs reviewed stated the need for additional manpower trained in ISD techniques and fully qualified experts in the subject matter. All programs reviewed stated, that due to inadequate levels of manning, training, and expertise, they had little, if any, time for innovation and improvement of the instructional system. The major effort of present ISD Teams under present staffing levels appears to be maintaining the existing instructional systems and keeping them current in their present configurations.

The following are recommended: (1) ISD Teams should be more adequately manned or supported to handle task loads imposed upon them. (2) ISD Teams should be manned with trained ISD specialists, or be trained following assignment. Since there is a long lead time required for assimilation of the ISD method and techniques, the former is recommended. (3) ISD Teams should be manned with subject-matter qualified personnel. Development experience in the Air Force and other services as well demonstrate distinct complications from use of non-experts.

3.2.3 Documentation of ISD Efforts

It was not possible to obtain much of the important documentation for the ISD programs reviewed because in some cases it did not exist and in others it was not easily obtainable. ISD makes use of such documentation extensively, particularly during the review of ISD decisions and policies. In fact, these documents form the foundation upon which a well-designed instructional system should be based. The lack of documentation should be remedied by insuring that ISD projects are well documented from the outset, both with working documents (Task Analyses, Objectives Hierarchies, CROs and CRTs, Media Selections, etc.) and in terms of rationale and process documents which explain how decisions were made, how processes were applied, and how and why policies were formed.

As well as insuring that documentation of the ISD effort is produced, a capability should be established to maintain and update it. Some difficulty has been experienced by the ISD Teams interviewed in obtaining current versions of the working documents which do exist from information storage, which has resulted in a reduced reliance upon them. An adequate documentation maintenance system must proceduralize the detection and registration of changes to documents and the production of current-version documents. It must also insure that this can be effected in a timely manner and without great difficulty by the ISD Team. Without provision for adequate and accessible documentation, ISD Teams cannot be expected to maintain updated systems exemplifying the benefits attainable through application of ISD.

3.2.4 Data Processing and Handling

A lack of adequate support in data handling and access has resulted in a variety of problems noted in the previous ISD programs studied. As noted in the previous section, on documentation maintenance, the problems in some cases have been extensive enough to make the data base unusable or to motivate personnel to leave it alone. Data bases which are used in ISD permit the study of system operation, detection of needed changes, and the update of the system in an organized and consistent fashion. Maintenance of data bases on student

performance and progress, on system operation and costs and capabilities to manipulate that data base to obtain reports and projections is important to the running of an effective and efficient instructional system.

The results of this review indicate that data processing support of this kind is not practically available due to the involved procedures and technical sophistication required to use presently available support. For an improvement of presently operating systems and for the implementation of word sophisticated systems in the future, there exists a need for a more responsive, (ideally a dedicated) system of ADP support to meet ISD Team needs.

The F-16 ISD contracted tasks include a task for the review and evaluation of existing ISD data automation and the development of recommendations for data processing and handling systems which will meet the needs.

3.2.5 Fighter Lead-in Training Output

Data gathered in the review confirmed that the student output of Fighter Lead-in Training will have high impact on the content of the F-16 "B" course.

If Fighter Lead-in Training for students destined for assignment to F-16 Combat Crew Training can be influenced by identified F-16 training objectives, the transition from Fighter Lead-in Training to CCTS training can be made more smooth and less marked by redundancies and gaps in training.

This will require cooperative development of the EFLIT and F-16 syllabi. That effort should be a joint F-16 ISD/EFLIT team approach initiated and coordinated through TAC Headquarters.

3.2.6 Tactics Training

The results of the review show clearly, based upon the experiences of the A-10 and F-15 community, that developing tactics and tactics training will be a problem area for the F-16 ISD Team.

Initially, a great deal of experimentation will be required in the development of tactics. Based upon the review data, F-15 and F-16 air-to-air tactics should be similar, and every advantage should be taken of the experiences gained by the F-15 ISD Team personnel and their "experimentation" efforts in establishing F-15 tactics.

For air-to-ground tactics, F-15 will not be a primary source of experience for tactics development and the associated training problems. In this instance, tactics development and tactics training for the A-10 and F-4 will prove more appropriate.

The need to develop tactics impacts upon an instructional system in terms of time-scheduled events. Tactics instruction lies at the heart of weapon system training. It therefore deserves the most careful attention and careful preparation. Unfortunately the late schedule for development of tactics will make it difficult to expend large amounts of time developing tactics instruction. This requires the development team to design flexibility and readiness to change and addition to the tactics portions of the F-16 pilot course.

3.2.7 CCTS and Continuation Training

The results of the review of previous ISD efforts show that establishing the line of division between what will be taught in formal (CCT) training and what will fall to the responsibility of continuation training can be difficult. Every advantage should be taken through additional detailed discussions and review with the F-15 and A-10 ISD Teams to learn from their experience in dealing with this concern.

3.2.8 Training Alternatives While Awaiting the Simulator

The results show that both A-10 and the F-15 systems experienced problems training certain tasks without the availability of a simulator at the beginning of their programs. This same situation will exist for F-16. Additional, more detailed studies should be made of the methods the A-10 and F-15 ISD Teams employed, such as the video tape developed for the F-15 INS system, in order to take advantage of their successful solutions to problems that can be expected in the design of the F-16 training program.

3.2.9 STAN/EVAL and Objective Student Evaluation

The review results clearly show the lack of objective student evaluation, especially in flying tasks. STAN/EVAL was clearly pointed out as the only area where criteria are clearly specified. Close cooperative efforts should be established early between the F-16 Team and STAN/EVAL in the area of CRO and CRT development.

As CROs and CRTs are established in the F-16 Training Program procedures need to be developed for a joint F-16 ISD/Stan Eval review to insure a common agreed upon evaluation baseline.

Additionally, in the design of the F-16 Performance Measurement System, careful attention must be given to the issues which prevent objective evaluation of student performance: lack of agreement on performance criteria, lack of sufficient IP training, lack of adherence to established judging procedures, and demotivating aspects of evaluation for IPs.